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ABSTRACT

Gareth Morgan's "Images of Organization" introduces readers to "holographic organization" and explores his concepts of connectivity and redundancy, simultaneous specialization and generalization, minimum critical specification, and self-organization. This paper attempts to put these concepts into operation successfully by using data, surveys, interviews, observations, and focus groups of 4-year case studies from 2 restructuring elementary schools. The paper uses the data analyses, presentations, and published reports from the project's first 3 years to structure interview and focus-group discussions so teachers can identify and describe specific behaviors and understandings that portray the 4 components of the "brain" metaphor. The study seeks to determine if Morgan's concepts have empirical referents in public education and can be used for future research; to learn whether the concepts have actual meaning for practitioners as opposed to researchers; and to determine if schools that function as "brains" provide distinct and effective services for their students. Results suggest that, taken collectively, these narratives and survey responses partially validate Morgan's framework. (Contains 43 references.) (DFR)

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Introduction

When experienced educators, administrators and teachers alike, read Gareth Morgan's (1986, 1997) *Images of Organization* in graduate classes, they are invariably most enthusiastic about Chapter 4, "learning and self-organization: organizations as brains. Morgan introduces readers to the image of the "holographic organization," and takes the reader through his concepts of (1) connectivity and redundancy, (2) simultaneous specialization and generalization, (3) minimum critical specification, and (4) self-organization. Our students find the ideal type truly ideal, a model for the structures and processes they hope to effect in their own buildings. Usually they ask for examples of research about schools that has used Morgan's ideas as its intellectual foundation.

Despite the popularity of *Images of Organization*, however, organizational researchers have not successfully operationalized his characteristics of holographic organization. We attempt to address this oversight by using data, including surveys, interviews, observations, and focus groups, from two four-year case studies of restructuring elementary schools. We used the data analyses, presentations, and published reports from the project's first three years to structure interview and focus group discussions in both schools so teachers could help us identify and describe specific behaviors and understandings that portray each of the four components of the brain metaphor. Because the schools grounded their reform efforts on the simultaneous introduction of multi-age primary classrooms and inclusion of special needs learners in those classrooms, they put a premium on communication, information, and adaptation, the very qualities that characterize organizational learning. The study had three main purposes: first, we wanted to explore whether Morgan's concepts had empirical referents in the everyday world of public education and could actually be operationalized in ways that might focus future research. Second, we wanted to learn whether the terms themselves, as Morgan described them, had actual meaning for educational practitioners (as opposed to researchers). Third, we hoped to investigate whether schools that functioned as "brains" provided distinct and effective services for their students.

Literature Review and Conceptualization

Morgan described the principles of holographic organization in the 1986 edition of Images of Organization. The work was evocative and revelatory, but also confusing and contradictory. He simplified and streamlined the presentation in revised edition (Morgan, 1997, pp. 102-115), but, because we built the research strategy around our interpretation of the earlier version, we have continued to use

it in this report. Hence we consider four features of holographic organization. The center column of Table 1 provides additional detail.

(1) Connectivity and Redundancy : Holographic organizations are holistic, characterized by connectivity and redundancy. In education what that means is that a school is seamless in that teachers will be attuned enough to one another's skills, curricula, and to student learning that they can maintain continuity given the inevitable disruptions of day-to-day classroom life. Connectivity provides an online back-up system in which knowledge about each another's approach, style, and expertise helps teachers step across roles in a fashion that does not disrupt student learning. They facilitate this by collaborative planning, team teaching, ongoing consultation and problem-solving, and formative assessment of student learning to identify issues and problems before they require massive intervention. Connectivity and redundancy can be implemented and reinforced when schools have strong internal cultures that stress mutual commitment of staff to students and to one another. Bossert (1988), Deal (1985), Hargreaves (1995) argue that strong cultures, which bind staff together through a collective sense of intimacy, subtlety and trust, are associated with school effectiveness.

(2) Simultaneous Specialization and Generalization. Specialization and expertise are essential if organizations are to deal with complex tasks and complex environments. It is a necessity for schools educating students with complex, diverse and changing needs, including those with disabilities. As student diversity grows--non-English speakers, students with disabilities, students whose families experience crises--the student body increasingly requires a wider range of specialists to identify and serve their needs. Morgan (1986) refers to this as the principle of requisite variety. This wide and seemingly expanding range of complex child and family needs requires schools to have diverse expertise, diverse perspectives, and capacity to respond appropriately. Cooper and Goldman (1996) describe the confusion that results in elementary schools when students in a single classroom are served by as many as eight different specialists. However, specialization also creates enclaves and sometimes reduces the capacity to communicate internally. Knowledge is not easily transferred because of differences in status and perspective as well as differences in knowledge. Moreover, there are limits to the time and capacity individuals have to communicate with one another. Hence, in a holographic organization, specialists will develop more generalists skills and vice-versa. Lawrence and Lorsch (1967) provided a model for this in their description of the role of "integrator" in the environmentally complex world of the plastics industry in the early 1960s.

(3) Minimum Critical Specification. The systemic process of minimum critical specification requires an organizational orientation towards problem solving rather than towards preset bureaucratic requirements. Morgan (1986: 101) argued that systemic, holographic learning organizations must "reverse the bureaucratic principle that organizational arrangements need to be defined as clearly and precisely as possible." Schools are open-ended systems driven by children having diverse, unpredictable, and changing academic and developmental needs. If regular education teachers and educational specialists are to take advantage of the

simultaneous specialization and generalization described above, they must have maximum opportunity to develop creative solutions to the learning problems their students face. Hence, a system with minimum critical specification would display tolerance for diversity of solutions so that even similar problems may engender different modes of address depending on contextual factors--classroom composition and chemistry, teacher skills, available materials. In the reform climate, the present emphasis on competencies, benchmarks, criterion-based, and curriculum-based measurement sets expectations, not norms, and allows school practitioners to work toward their own answers.

(4) Ability to Self-Organize. According to Morgan, in holographic organizations, members will have "learned to learn." That is, they will put in place relationships, cultures, and skills that allow them to scan and monitor the environment and, more important, to develop feedback loops. This must be systemic, and the organization must be willing to change assumptions as well as behavior if conditions warrant it. In schools, administrators and teachers special roles in helping to shape and manage the systemic transformation of schools into learning organizations (Senge, 1991). More than anything else, this requires creating time to learn, time to exchange, and time to decide collectively (Goldman, et al., 1993).

Morgan's description of "organizations as brains" is a metaphorical explanation of the process by which might or actually do locate and collect relevant information from and about their broader environment, how they process and share that information internally, and how they use it to improve their performance. He suggests that the metaphor has its roots in cybernetics, in decision-making theory pioneered by Herbert Simon (1947; March and Simon, 1958), new research on the brain, and the efforts of such researchers as Bo Hedberg (1981) to integrate concepts of intelligence with organizational behavior. Educational researchers have also begun to explore organizational intelligence in schools. Karen Seashore Louis and her colleagues at the Center on Organization and Restructuring of Schools have studied the possibilities and limitations of professional community. They have been particularly interested in teachers professional interactions outside classrooms and its impact on teacher responsibility for student learning (Louis, et al., 1996; Kruse and Louis, 1997). Kenneth Leithwood and his colleagues at the Ontario Institute for Studies in Education have studied the relationship between educational leadership and the information processing capabilities of school buildings and school districts (Leithwood, 1995; Leithwood and Aitken, 1995; Leithwood, et al., 1995).

Those researchers have been responsive to North American educational reform efforts. A whole range of reform mandates and educational innovations--proficiency, student portfolios and work samples, integrated curriculum, school-to-work programs, inclusion of special needs and ESL students into regular classrooms, site councils--has placed a premium on information collection, distribution, and utilization (Conley, 1997). Accountability has assumed a more central place in public education (Newmann, et al., 1997). However, specific programs, including

such empirically-supported strategies as adoption of cooperative learning or curriculum-based assessment, are simply added on to current instructional practices in an incremental or additive fashion. It has often been difficult to integrate parts with the whole, although efforts to develop and convey a "school vision" or "school community" create the perception of the school as a holistic phenomenon (Sergiovanni, 1994). Furthermore, use of building-wide thematic curricular emphases, writing across the curriculum, and thematic curricula are examples of schools' efforts to integrate parts with the whole through cohesive programs (Boyer, 1995). Fullan (1996) suggests that "reculturing [is] the process of developing values, beliefs, and norms. Restructuring [is] changes in the roles, structures, and other mechanisms that enable new cultures to thrive" (p. 422).

We note one qualification in how we interpret Morgan's schema. He placed a strong emphasis on the organizational "brain's" ability to scan, interpret, and utilize phenomena originating outside the organization. While schools react and adapt to externally generated changes in mandates, demographics, and program innovations, their most significant use of organizational intelligence manifests itself in how they collectively manage internal stimuli, specifically the progress (and lack of progress) of each child in the school.

Methodology, Data Collection, and Analysis

We wanted to determine if Morgan's framework for understanding organizational learning was applicable to schools and their efforts at restructuring. In other words, could we find evidence of the four processes he describes as central to learning organizations? We selected two study sites that chose a school restructuring strategy that required them to deal with issues of organizational intelligence. Both schools attempted to increase degree of special needs learners' inclusion in regular classrooms, which invariably increase the need for exchange between regular and special educators. In fact, both hoped to do some "pull-in" instruction, that is to have some special educator presence in the regular classroom. One of the schools, Dunlap, made a serious effort to be trained in curriculum-based assessment of student learning and to use the data they generated to adapt their curriculum and instruction to the needs of individual children. At Wellington, most students had two regular teachers, one in their heterogeneous "homeroom" and the other in reading groups that were constituted based on skill level. Both schools created situations that would require more communication than we see in most schools and more than they had needed in previous years. Both schools carved time out of their schedules for exchange between team members. Dunlap had early release on Wednesdays with the time being dedicated to small group meetings (rather than faculty meetings or preparation time) and Wellington had three hour off-campus monthly retreats. These are not typical schools, but their organizational choices did provide context quite favorable for studying organizational intelligence.

Demographics and Contexts of Two Schools

Dunlap and Wellington Schools each joined a federally funded 4-year (1993-1997) partnership with a local university that provided resources to support changes designed and initiated by each building staff. Both schools created multi-age, developmental primary programs as an organizational structure for reframing curriculum and instruction to provide adaptive, inclusive learning environments for their students, including those identified for special education services. Participation in the grant provided teachers with training by university staff in team-building processes and assistance in development and use of curriculum-based assessments. They used release or extended contract time to plan collaboratively, score assessments, and discuss the outcomes.

Dunlap, a K-5 school with about 550 students, is located in a semi-urban district serving nearly 4,500 students in the Pacific Northwest. The school's socio-economic status (SES) ranking is slightly below state average, and students come from predominantly white (87%), working class families. Other ethnic demographics include: Hispanic (6%), Asian-Pacific Islander (3%); African American (2%) and American Indian/Alaska Native (2%). Teachers from Dunlap participating in the study (n=9) include seven primary level (Grades 2/3 multi-age) general education teachers and two resource room teachers who each work half time. Teachers average more than 9 years in the school and 14 years in the district. The principal has been the building administrator for 6 years and has been a school administrator in the district for 18 years.

General educators in this team operationalize their developmental approach predominantly through the use of whole language instruction in heterogeneous whole class groups, project-based learning within thematic units, and cooperative learning. They work collaboratively to develop, administer, score and analyze curriculum based measures three times each year in reading, writing, and math. The resource teacher coordinates her instruction with the thematic approach but uses more direct instructional techniques and programs.

Wellington is a K-5 urban school with a population of about 325 students. Located in a in the same community as Dunlap, the school district of which it is part serves approximately 18,000 students. The school's socio-economic status ranking is somewhat lower than Dunlap's, right at the 25th percentile of its state. Student demographics include: Caucasian (67%), Hispanic (10%), Asian-Pacific Islander (10%), American Indian/Alaska Native (8%) and African American (5%). Approximately 10% of the students at Wellington do not speak English at home; many of these non-English speaking students are children of international students who live in university student housing near the school. The primary team at Wellington has modified its schedule to accommodate small groups for reading instruction by employing a staggered starting and ending time for students in Grades 1 and 2.

Participants from Wellington (n=7) are five primary level (Grades K-2 multi-age) general education teachers, one resource room teacher, and a Title I teacher. Teachers average more than 10 years in the school and 18 years in the district. They received Bachelor's degrees between 1966 and 1973; all but one of the participants from Wellington hold Master's degrees as well. Their total years in teaching range from 19 to 29, with the majority of those years being at the elementary level. The principal has been the building administrator for 7 years and has been a school administrator in the district for 16 years.

General educators in this team operationalize their developmental approach predominantly through the use of ability grouping across all K-2 classrooms for reading and language instruction (i.e. Joplin plan, see Slavin, 1983), direct instruction techniques and programs, and cooperative learning. The Title I teacher and resource teacher are part of the grouping strategy and instruct groups with students of lower ability regardless of their formal identification for special services. The Title I teacher and her aides administer assessments in reading and math each fall and spring. The team uses the fall data to form instructional groups and the spring data to assess growth. Each teacher documents oral reading fluency at least three times annually using selections from the student's reading program and level.

Data Collection

We had a significant research presence in both Dunlap and Wellington between 1993 and 1997, carrying-out more than 100 of interviews and classroom observations and more than 50 observations of team and staff meetings. We also conducted ongoing training around curriculum-based measurement, consultation, and team-building. Morgan's typology had been part of the original research proposal, but we had not addressed it in our interpretations of data collected during the study's first three years, focusing instead on more general issues of organizational learning and organizational change (Goldman and Tindal, 1996, 1998a, 1998b; Goldman, et al., 1997). In this study we explicitly investigated specific characteristics of Morgan's "holographic organization."

The research team collaboratively and recursively generated survey questions intended to elicit responses related to Morgan's four categories of interdependent processes. We administered surveys to all participants in the study (n=16). The research team introduced and distributed surveys at team meetings. Teachers completed the surveys independently of one another. Survey respondents were identifiable to facilitate our ability to probe written survey responses in a follow-up semi-structured interview. All general and special education teachers involved in our study at the two schools completed survey forms. Responses are detailed in Table 2. Note that this table provides largely illustrative data best understood in the context of interviews described below; the small sample size precludes statistical analysis.

After the surveys were collected, we conducted semi-structured interviews with 14 general and special educators in two schools. We did not interview one teacher from Dunlap because she was new on the late primary team, and we did not

interview one teacher from Wellington due to illness. Participants were asked to bring portfolios of student work for one of their target students (students on IEPs of particular interest in our research) to the interview in order to enhance teachers' talk about instructional programs, assessment and student progress.

Interviews were tape recorded and transcribed. To determine if teachers' comments could be categorized reliably using our interpretation of Morgan's (1986) framework and related attributes, members of the research team worked independently to code portions of several of the transcripts using a different color for each of the four processes. Upon completion of this independent task, we met as a group to share our coding results and discovered that each individual had encountered a similar problem. We found considerable conceptual overlap between the processes and that: (a) we often coded a single thought sequence with two or more colors, (b) it was easier at times to determine which processes were not indicated by a particular statement, and (c) furthermore, we were generally in agreement regarding which overlapping processes were evident in a given interview passage. Finally, we could not attribute much of what teachers said to single categories using Morgan's framework, however we achieved consistency in our interpretations when coding using multiple categories.

To aid our interpretation of the interview responses through Morgan's framework, we employed Roth's (1996) ethnographic methodology, "learning history," which presents an analysis format designed to assist organizational participants in understanding and evaluating their own efforts at reform. Roth's approach is typical of methodologies for describing, analyzing, and interpreting qualitative data. It attempts to transform these data systematically "in order to identify essential features and relationships" (Wolcott, 1994, p. 24). This may involve highlighting certain patterns in a narrative according to the focus of the research or applying a particular framework for analyzing the data (such as Morgan's categories) and interpreting the results of that process. In practical terms, this means presenting the data in a way that best identifies instances of patterning or of the analytical framework used (see Wolcott, 1990, 1994).

As Roth (1996) points out, in writing learning histories, researchers "need to account for their choices in asking questions, collecting, and selecting data" (p. 14). Our interest was in tracing the presence of four processes and noting their interdependencies and significance in educational settings. In addition to using the interview responses to elaborate on four preconceived dimensions of a learning organization, we looked for common themes and recurring ideas which might help us consider the usefulness of this categorical framework for understanding restructuring schools and their cultures. These themes have been elucidated in the results and discussion sections which follow.

Results and Discussion

In this section we summarize results of interviews and surveys in the context of Morgan's (1986) categories of systemic processes. The section is divided into four parts, reflecting the a priori categories: connectivity-redundancy, simultaneous

specialization-generalization, minimum critical specification, and the ability to self-organize. With the interview used to guide the meaning of the construct, and the survey designed to highlight its specific presence, we describe each of the four constructs. Table 1 provides a graphical summary and includes examples from interviews.

Connectivity and Redundancy (C/R)

We looked, hopefully, for evidence of continuity of services and a sense among participants that the organization is operating as a singular entity, its parts coordinated. In interviews, teachers described engagement in features of C/R: collaboration and communication, knowledge of colleagues' style, expertise, and curricula, mutual commitment and responsibility, shared understanding and trust. There appeared to be a connectedness at both the instructional and administrative levels, creating capability of the organization to continue to operate smoothly despite day-to-day contingencies that might arise.

Within the context of inclusive programs, teachers' familiarity with students' Individualized Education Plans (IEPs) would be a critical indicator of C/R. In both schools, teachers reported high familiarity with student IEPs and involvement in their development. However, responsibility for monitoring a student's progress was generally regarded as falling to the special educator. However, only one teacher indicated that both the general and special education teachers shared responsibility. In addition, no teachers from either school indicated that the general and special education systems operated as a single, merged system. This would be the opposite of what we might expect if C/R was fully embedded within the team's functioning.

Because collaboration is a key element in this process, we asked several questions regarding the nature of collaboration in these schools. Results indicated greater collaboration among general educators than between general and special educators. Teachers did not report a high degree of collaboration between general and special educators to design specialized programs for individual students.

Connectivity is reflected in the degree to which teachers consider themselves familiar with their colleagues' styles and techniques. In both schools teachers indicated greater familiarity with general education colleagues' strategies than with those of special educators. Wellington teachers reported greater familiarity in both instances. Relevant to teachers' familiarity with one another's strategies is their assessment of the effectiveness of communication between general and special educators. Across schools, teachers rated the effectiveness of communication generally high.

Finally, the relationship between general and special education programs is an indicator of how embedded connectivity-redundancy is in the school. At Dunlap, only 2 (of 7) teachers indicated the systems were separate and operated in isolation from one another. Another 3 indicated the systems were separate but there was some degree of collaboration and coordination between them. Most of the Wellington teachers described their systems as partially merged with some team

teaching among general and special educators. None of the respondents reported that a single, merged system of general and special education operated in their school.

Simultaneous Specialization and Generalization (S/G)

Every teacher interviewed provided multiple examples of the presence of simultaneous specialization and generalization as they alluded to (a) roles and responsibilities, (b) interdependency between general and special education, (c) a range of specializations to accommodate needs of individuals, (d) shared knowledge and expertise, and (e) the configurations of programs and service delivery. Some practices were prevalent at both sites (i.e. shared knowledge and expertise and interdependency), while other practices were seen as desirable but not necessarily prevalent (i.e. seamless delivery of services).

Simultaneous specialization and generalization, characterized by interdependence between general and special education in schools, requires the existence and utilization of a range of specializations to accommodate diverse learner needs. The clarity with which staff members understand the various roles, responsibilities, and expertise of colleagues should influence the school's ability to design, implement and monitor multiple sequential adaptations for individual programs. Considering routines through which interdependence between general and special educators can be achieved, we asked teachers to rate several structures for their potential impact on the ability of general and special educators to share information. Teachers from both schools related that direct consultation had the greatest impact and general education classrooms and administrative policy had the least. The value teachers place on direct consultation as a vehicle for sharing information may contribute to the interest indicated in receiving specialized training for meeting the needs of students with disabilities in general education classrooms, particularly noted by Wellington respondents. Interestingly, general education teachers from both schools suggested that instructional programs for students with disabilities were not very specialized. Wellington teachers reported instructional approaches between general and special educators was very similar while only one Dunlap teacher found them similar.

Our survey response data indicate direct consultation between general and special educators is vital to the team's ability to plan and deliver adaptable programs for students with special needs. Consultation may be vital at Dunlap to bridge the apparent dissimilarities between regular education classrooms and resource programs, and it may contribute to similarities between the programs at Wellington. The high ranking that teachers assigned to interest in receiving specialized training validates Morgan's (1986) conception of simultaneous specialization and generalization, which emphasized sharing knowledge and expertise, thereby increasing one's ability to move in and out of various roles in implementing adaptable programs.

Minimum Critical Specification (MCS)

We also were able to find examples in teacher interviews from both school sites of the process Morgan calls minimum critical specification. MCS is illuminated when teachers describe an orientation toward problem solving in which variable contexts produce a diversity of solutions. Explication of the individualized education plan (IEP), and its use as a programmatic tool, indicate the presence of MCS. Minimum critical specification includes the ability to design individualized plans based on specific data and understanding of an individual student's needs and learning problems. The IEP, then, is seen as a focal point of this dimension; therefore, we anchored a number of our survey questions to usefulness of the IEP and related processes of IEP development, implementation, and evaluation.

Responses from both schools indicate teachers found the IEP very useful as a communication device in their ability to describe important components of the student's educational plan and highlight program outcomes for other professionals and parents. Most teachers from both schools said they felt well prepared to deal with the learning problems of students with disabilities; Wellington teachers indicated greater confidence. Furthermore, teachers indicated they were at least somewhat prepared to work with special education teachers in implementing individualized programs of instruction. Teachers from both schools indicated their belief that school-wide problem-solving systems were accommodating in addressing the learning problems of individuals.

In consideration of the schools' open-ended approach to problem solving, most of the respondents indicated they brainstorm with others to develop solutions to learning problems. Teachers emphasized the importance of procedural issues relative to the IEP and use of the IEP as a communication tool. They noted collaborative processes, such as brainstorming, as highly useful in creating diverse solutions to similar learning problems. They perceived the skill of personnel and parental support as critical to their ability to address students' needs in unique ways and had a strong belief that teachers were empowered to create solutions to classroom problems through school-wide problem solving systems.

Ability to Self-Organize (ASO)

Excerpts from teacher interviews from both school sites illustrate the ability to self-organize. This process is demonstrated when teachers describe an implicit understanding of the rules for making changes and the degree to which they are empowered as individuals, team members, and staff members to make changes. Thought sequences that allude to the school as a "learning organization" indicate presence of this feature as do references to facilitative leadership and site-based decision making practices. The ability to self-organize reflects the capacity of the school to become a learning organization. It is characterized by facilitative leadership and some form of site-based decision making with both instructional and administrative foci. Implicit and explicit governance structures are indicated, as well

as rules for making change that are understood by those in the organization. Members of various levels of the organization must recognize the parameters of their decision-making domain and understand the extent to which they are empowered to act on their ideas.

We asked teachers at which level decisions about various issues are made (i.e. individual teacher, grade level team, site council, building principal, district offices). They considered decision making concerning curriculum materials, instructional methods, schedules, placement and grouping of students, inservice and training for staff, and allocation of special education resources. Respondents overwhelmingly indicated that decisions about curriculum materials are made by teachers; however at Dunlap this was left to grade-level teams and at Wellington decisions about curriculum materials were primarily the responsibility of individual teachers. Concerning instructional methods, individual teachers hold primary decision-making responsibility.

Decisions related to placement and grouping of students appeared to be made by teachers in both schools, although 86% of the Wellington respondents indicated teams were responsible for these decisions and 67% of the Dunlap teachers indicated that individual teachers were responsible. No teacher from either school reported that site councils, principals, or district level administrators were responsible for student placement and grouping decisions. When asked to what extent teachers had discretion to act on decisions they made regarding alternative instructional approaches for children receiving special education services in their building, Wellington teachers reported they routinely had the discretion to do so, although Dunlap teachers indicated they had less discretion to act.

Results indicate that decisions most closely related to classroom practices (i.e. curriculum materials, instructional methods, placement and grouping of students, educational programs) were the responsibility of teachers, either as individuals or as members of instructional teams. Decisions which were likely to have financial implications (i.e. inservice and training, allocation of special education resources) are made by broader, representative groups such as site councils and administrators. Decisions affecting multiple classrooms (i.e. scheduling) were relegated to diverse groups such as instructional teams, site councils, and building principals. In summary, the ability to self-organize was apparent for classroom-based issues while at times constrained by financial concerns and necessary coordination with others.

Discussion

An Emergent Framework

Interview and survey questions were designed to explore the legitimacy of using Morgan's model of systemic interdependencies to understand school cultures and reform efforts. Each individual narrative threads in and out of the categories (see Tables 1 and 3), indicating the presence of all four (see Tables 6-9) and demonstrating the importance of the elements these processes embody for schools striving to become "more flexible holographic learning organizations where

educators as well as children are continually broadening and deepening their knowledge and skills" (Tindal et al., 1993, p. 7).

Taken collectively, these narratives and survey responses partially validate Morgan's (1986) framework. An emergent framework from our interview data encompasses three themes: (1) the pervasiveness of all four processes, (2) connectivity and redundancy as a necessary condition of the other categories, and (3) interdependence among categories.

Each of Morgan's (1986) processes were identifiable many times over in our interview narratives across both schools. It might be argued that these processes are illuminated in the narratives because the interview questions were designed to elicit them. Nevertheless, the fact that the teachers responded to them at length and in detail that evoked the four processes and their defining attributes indicates their legitimacy. Not one of our interview narratives neglected any of Morgan's categories as we have interpreted them through defining attributes.

The process of connectivity and redundancy requires responsibility for learning among all staff charged with a child's educational program. Its presence is illustrated by demonstrations of shared understanding and mutual commitment. The communicative and collaborative features of this process, noted throughout the interview summaries, seem to be necessary pre-conditions for the ability of school staff members to talk about, articulate, and operationalize dimensions of S/G, MCS, and ASO. Development of C/R apparently builds capacity within the school system and provides the foundation which allows the other three processes to thrive, thus creating a holographic learning organization. C/R emerged as a requisite step for the "reculturing" Fullan (1996, p. 422) describes as central to systemic change to take hold in schools.

That the four processes overlap conceptually is evident in the intensive interplay found among them in the interview narratives (Table 3). As teachers responded to questions, their talk moved easily from illuminating attributes of one category to another and back again within the context of a single thought sequence. Furthermore, ideas expressed by teachers often moved from C/R and S/G to other categories as teachers described how the school is "learning" about alternative configurations, that is, "seeing" alternative structures in relation to existing structures (Sarason, 1996) which may lead to more cohesive and effective programs for students. Teachers' perceptions of the need for greater interdependence between general and special education programs align with the notion that systemic, rather than additive, processes may positively affect the "inclusion of students with disabilities into broader educational reform and restructuring initiatives" (Tindal et al., 1993, p. 5).

Features of C/R and S/G, such as collaboration and shared knowledge, are consistently implied throughout the interviews. They have therefore emerged as central to, and necessary for, processes of minimum critical specification and the ability to self-organize to develop. Interdependence between C/R needed for program development and articulation and S/G that highlights collaboration

between general and special educators in implementing the programs was mentioned frequently. This interpretation is compatible with Dunlap and Goldman's (1991) assertion that communication among professional staff is crucial in implementing "such new and innovative programs as nongraded classrooms and inclusion of children with disabilities." Furthermore, features of C/R and S/G are prominent in Schmuck and Runkel's (1994) approach to organizational development in restructuring schools.

Morgan's framework of interdependent processes helps to define the structures identified by Fullan (1996) and Wyner (1991)— the roles, relationships, assumptions, values, shared meanings, and expectations which shape the daily life of a school. Viewing these processes from a systemic perspective can assist restructuring schools to create cultures capable of reform through recognition of alternative structures and taking into account the value-laden (rule driven) and role-oriented nature of school cultures. Furthermore, a systemic perspective highlights developing the capabilities of those within the organization to learn new patterns of roles and relationships as minimal preconditions of successful reform efforts. Morgan's simultaneous specialization and generalization addresses issues of roles and relationships. The cultures of these two schools, as illuminated by Morgan's interdependent processes, exemplify norms and conditions we believe are conducive to continued organizational learning. The difficult task of fundamentally changing structures (i.e. roles between general and special educators) in alignment with their vision of alternatives is still ahead of them.

Conclusion

Our analysis of narrative and survey data, through both the lenses of Morgan's dimensions of holographic learning organizations and themes that emerged from teachers' perspectives, leads us to support Morgan's conception of schools as holistic entities functioning in ways similar to living systems (i.e. the brain), and believe it is a useful construct for understanding schools as learning organizations. More importantly, can the experiences of these two schools offer insight to others attempting similar reform efforts? We believe they can.

It is evident from this study that effectively functioning teams utilize the communicative and collaborative dimensions of connectivity and redundancy. As Schmuck (1995) has noted, team functioning may become critical in fostering school restructuring. However, C/R may be a prerequisite to development of other aspects of learning organizations; schools undertaking systemic reform efforts may find team building a useful, indeed necessary, way to begin. In addition, purposeful sharing of expertise and knowledge between generalists and specialists should enhance the school's ability to develop interdependence and flexibility of roles and responsibilities in designing, implementing, and monitoring adaptable programs to meet diverse student needs. Fluency in these processes over time contributes to a school culture which embodies norms of collaboration, trust, and shared responsibility. Development of C/R and S/G will contribute to the school's functioning as an open-ended system capable of solving similar problems in unique

ways. Therefore, time set aside for collaborative efforts seems necessary for successful reform. Finally, with facilitative leadership and shared decision making through which teachers are empowered to act on creative solutions, the restructuring school may develop the capacity to become a learning organization through systemic rather than additive processes.

Even with many of these elements of Morgan's framework present, several specific practices relating to consultation and assessment were thin in their presence and may require more time (Hord & Boyd, 1995) to foster a solid basis for restructuring special educational delivery systems. In neither school was special education fully integrated with general education, for a variety of reasons. In Dunlap, a pull out model maintained an element of separate systems (Schrag, 1993), a problem which had initially led many schools to begin their efforts at restructuring. And, in Wellington, though similar in approach to general education programs, special education programs maintained a separate schedule for pulling out students.

Though both schools reflected many shared cultural norms about teaching and learning, the delivery systems in both have remained somewhat traditional. Apparently, multiage programs provide no added advantage in merging two systems. Nevertheless, in both schools, teachers spoke a common language of student achievement. In Dunlap, this language was initiated by the adoption of curriculum-based assessment in the general education teams, a form of assessment that had been in place in special education for many years earlier. In Wellington, this discourse was fostered by adoption of district-wide Title 1 practices that focused on improvement of poor performance of classroom-relevant behaviors (i.e., reading words correct per minute, letter sounds and names, etc.). And in both schools, a restructured report card provided a bridge for teachers to not only communicate among themselves, but share the effects of their programs with parents. In the context of Morgan's framework, assessment apparently has the capacity to serve as the proxy for connectivity-redundancy, which in turn becomes a major requisite to other elements of reform.

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Table 1. Attributes of Morgan's Four Interdependent Processes

Dimension	Attributes	Examples
Connectivity/ Redundancy	collaboration communication mutual commitment/responsibility team teaching trust shared understanding knowledge of colleagues' work programmatic problem solving	"I told A, 'Next time I come in this is something we need to work on, because they don't get it'. . .so I'm going to take the kids again, and let's use some manipulatives . . . this is really good for me to see what the other kids do." (Dunlap)
Simultaneous Specialization and Generalization	interdependency between general & special education range of specializations to accommodate diverse needs seamless delivery of programs assessment feedback to all on team articulation of roles/responsibilities ability to design multiple sequential adaptations shared knowledge & expertise	"My goal has been to try to keep him in our classroom with all the academic subjects. . . I want to make sure that even though he goes away from math, reading and writing, that he also gets math, reading, and writing here . .." (Dunlap) "It is helpful as a specialist, and I think it is helpful for each other. I think that they have let people teach to their strength . . . which means using the programs that they feel most comfortable with." (Wellington)
Minimum Critical Specification	orientation toward problem solving school system is open ended creative solutions to learning problems diversity of solutions based on variable contexts ability to design individualized plans	"When we write IEPs we can compare what the child's doing right now, with what an average Dunlap student is doing, and we can write it so that they're making progress toward that as a goal . . ." (Dunlap) "His IEP is very specific. A lot of times when you have a group of first graders I tend to write their goals similarly, but his are very specific to him . . . still working on sounds. . ." (Wellington)
Ability to Self-Organize	implicit rule governance for making changes capacity of school to become a learning organization facilitative leadership site-based decision making with both instructional & administrative foci	"We make the decisions . . . special ed teachers, parents . . . the only time it gets out of our hands is if it's a money issue . . . you need to trust that we know what we're doing. . ." (Dunlap) "[J] and I kept looking at her and saying 'you know, she's not really making the grade in that group either. So we better refer her to the staffing team'. . . we brought the portfolios, we brought the family history . . ." (Wellington)

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Table 2. Survey Responses

	Dunlap (N=9)	Wellington (N=7)
Connectivity-Redundancy		
How familiar are you with the IEP (goals, objectives, accommodations)? (Not familiar to very familiar)	4.1	4.5
How involved were you in writing the IEP (determining goals)? (Not involved to very involved)	4.4	3.2
To what extent do you collaborate with special educators to design specialized programs? (Not at all to routinely)	2.9	2.3
To what extent do you share student assessment data with special educators? (Not at all to routinely)	2.8	2.9
How familiar are you with teaching strategies of general educators on your team? (Not familiar to very familiar)	4.0	4.7
How familiar are you with teaching strategies of special educators on your team? (Not familiar to very familiar)	3.0	4.5
How effective is communication between general and special education programs in the school? (Not effective to very effective)	3.7	4.7
To what extent does the principal facilitate a climate of collaboration? (Not at all to routinely)	3.2	3.0
Specialization-Generalization		
How interested are you in receiving specialized training to meet needs of students with disabilities in general education classrooms? (Not interested to very interested)	4.2	4.1
How specialized are instructional programs for students with disabilities? (Not specialized to very specialized)	3.3	4.0
How similar are performance measures in general and special education classrooms? (Not similar to very similar)	3.4	3.0
How similar are curricula between general and special classrooms? (Not similar to very similar)	2.3	3.3
How similar are instructional strategies between general and special classrooms? (Not similar to very similar)	2.4	3.3
Participation in general education activities relates to the need for specialized services (Strongly disagree to strongly agree)	3.4	4.3
Participation in general education activities relates to the ability to work independently (Strongly disagree to strongly agree)	3.2	4.6
Participation in general education is affected by the student's social and behavior skills (Strongly disagree to strongly agree)	2.2	4.2
Literacy affects students' participation and independent work in general education classrooms (Strongly disagree to strongly agree)	3.9	5.0

Minimum Critical Specification		
How useful is the IEP as a communication device with other teachers and/or parents? (Not useful to very useful)	4.4	3.8
How useful is the IEP for planning and delivering instructional programs? (Not useful to very useful)	3.1	3.8
How prepared are you to address learning problems of students with disabilities? (Not prepared to very prepared)	3.6	4.6
How prepared are you to work with special education teachers in implementing specialized programs? (Not prepared to very prepared)	3.1	4.9
To what extent are school-wide problem solving systems accommodating to students with disabilities? (Not accomodating to very accomodating)	3.8	4.1
How often do you brainstorm with others to solve student learning problems? (Never to always)	4.0	4.0
To what extent do you feel empowered to create solutions to classroom problems? (Not empowered to completely empowered)	4.2	4.3
Ability to Self-Organize		
Rank, in order of frequency, the focus of communication at staff meetings for each of the following (Least frequent to most frequent)		
Student related issues	1.9	2.0
Updates on policy issues	4.1	4.3
Arranging meetings	1.7	1.5
Program/curriculum changes	2.8	3.3
Day-to-day procedures	3.9	3.8
At what level are decisions made about the following? (1=individual teachers; 2=grade teams; 3=site council; 4=principal; 5=district admin.)		
Curriculum materials	2.0	1.3
Instructional methods	1.1	1.0
Schedules	3.4	2.1
Placement/grouping	1.3	1.9
Inservice/training	2.8	3.7
Allocation of special education resources	4.4	4.3
To what extent do you have discretion to act upon team/group decisions regarding alternative instructional approaches? (Not at all to completely)	4.0	4.0

Table 3. Combinations of Morgan's Four Interdependent Processes

Combinations	Examples	Interpretation
Connectivity/ redundancy *AND* specialization and generalization	"K.'s IEP deals directly with her reading instruction. . . she did not stand out at all because I do everything in a way where you needn't be able to read... to be successful.	The teacher notes many features of C/R and S/G related to shared understanding and consultation among teachers and parents to provide a seamless program without segregating the student
Connectivity/ redundancy *AND* Minimum critical specification and . . .	"I'm very familiar with the IEP. . . It's more a way of communicating and checking progress long-term, but from day to day that's not what I look at when I make plans, I kind of look at the bigger picture . . . It's pretty much a team effort to make the IEP goal."	Reflects the value of the IEP as a tool to communicate and monitor long term goals. It also demonstrates an orientation to problem solving in an open-ended system as general and special educators give and take in the goal-setting process.
Connectivity/ Redundancy *AND* Ability to self-organize	In my head everyday, I go over every child. It's kind of like a punch list if there's something that stands out or doesn't fit, you touch base with the person and say, "have you noticed this?" . . . We keep that little check list and when we see each other in the breezeway ...	Finding ways to make this happen routinely (i.e. email) in the face of organizational complexity constrained by time factors implies an orientation toward problem solving (MCS) and help Wellington to learn as an organization.
Specialization and generalization *AND* Minimum critical specification	". . . it's like we're two separate schools within a school where resource does their thing and we do our thing in the classroom and it doesn't necessarily connect. . . and we want to try and work on that. . . [so] L. to come in and work with small groups . . . I like to see that happening again next year . . . I hope it's more of a team teaching situation. . . "	The statement implies that some level of understanding of each other's programs and expertise appears necessary to create diverse solutions for students with learning problems.
Specialization and generalization *AND* Ability to self-organize	". . . the Dunlap psychologist did testing because it was a three-year evaluation . . . found that he was no longer eligible. . . I also shared the assessment we've been doing in the classroom. . . "	Shared knowledge and expertise in student assessment reflect the interdependency between general and special education professionals. Assessment data are used to change the student's program and placement which demonstrates the system's Ability to Self Organize
Minimum critical specification *AND* ability to self-organize	...we did identify her so early... that I doubt that she will be on the IEP for very long...	Early identification and intervention with learning problem (C/R) highlights this learning organization's use of data from multiple sources such as family history (ASO).

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